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ABSTRACT

The development and dissemination of science materials can be associated with technical delivery systems such as the Unified Network for Informatics in Teacher Education (UNITE). The UNITE project was designed to investigate ways for using computer networking to improve communications and collaboration among university schools of education and K-12 schools. This paper describes computer networking strategies, for building collaboration, which evolved during the Integrative Network for Science Teaching Exploration and Practice (INSTEP) project. Several of the INSTEP strategies grew out of experiences from the ongoing UNITE project for investigating teacher support activities across a range of content specialties. Three integral networking components support the goals of this project: electronic mail, a curriculum navigator, and community published dynamic resources. A detailed description of each of these components is provided. Discussions on cross-school inquiry activities and initial observations are included. (KR)

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Computer Networking Strategies for Building Collaboration Among Science Educators

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Lake Geneva, Wisconsin

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Computer Networking Strategies for Building Collaboration Among Science Educators

Ronald Aust

National educational agencies, including the American Association for the Advancement of Science (AAAS) (1989), the National Science Foundations (1981) and the Holmes Group (1990), have called for broad-based initiatives to address the development of problem solving and inquiry skills in today's students. John Goodlad (1990) and others (Maeroff, 1988; McDonald, 1989; Sirotnik & Clark 1988) have contended that the successful implementation of change across schools requires strategies which build collaboration while recognizing the individual efforts of teachers. This paper describes computer networking strategies, for building collaboration, which evolved during the Integrative Network for Science Teaching Exploration and Practice (INSTEP) project. Several of the INSTEP strategies grew out of experiences from the ongoing UNITE project for investigating teacher support activities across a range of content specialities.

The Unified Network for Informatics in Teacher Education (UNITE) was established in the Fall of 1989 to connect sixteen schools in six eastern Kansas districts with the University of Kansas School of Education. The UNITE project is designed to investigate ways for using computer networking to improve communications and collaboration among university Schools of Education and K-12 schools. The teacher education constituencies targeted by UNITE include: school administrators, practicing teachers, student teachers and university faculty. Three integral networking components support these goals: electronic mail, a curriculum navigator and community published dynamic resources.

Communicating with Electronic Mail

Because electronic mail is transferred and stored in a digital format, it can also readily capitalize on computers capabilities to organize, access and manipulate large amounts of information. Through UNITE's electronic mail component (Figure 1), users can quickly deliver personal messages to other educators or broadcast messages to the Special Interest Groups in their content specialties. Messages sent through UNITE have encompassed topics such as, classroom management, instructional design, curriculum development, access to instructional resources, quest speakers and notices of upcoming educational events. UNITE's electronic mail is used in the INSTEP project to coordinate and support cross-school inquiry activities designed to engage students and teachers from all grade levels in collecting analyzing and drawing conclusions from data used in Science Education.

Exploring Resources Through the Curriculum Navigator

The curriculum navigation component (Figure 2) serves as a the framework for accessing and contributing to the catalogs of dynamic resources. Currently, the navigator has 16 content hierarchies (Language Arts, Math, Science...), with several hierarchies having over 100 sub-categories. Each content hierarchy is further expanded through cross-referencing with the primary support categories of administration, courseware, research and teaching. Including cross-referencing with support categories, the UNITE system incorporates HyperText approaches (Bush, 1945; Nelson, 1982; Halasz, 1987) to encourage users to explore a variety of resources.

The navigator's links to instructional support are indicated by icons representing the resource catalogs now available through UNITE: Field Trips, Lesson Plans, Courseware Descriptions and Research Abstracts. (see Figure 3 & 4 for examples). The catalogs of instructional resources are described as dynamic because they can be expanded or modified by any user on the system through a contribution and review process. Each catalog is essentially a distinct data-base consisting of tailored fields and in some cases, links to other support. For example, after reading a description in the courseware catalog, users click a preview button to view on-line instructional software.

Developing Community Published Resources

The INSTEP plan begins by involving teachers in selecting a general science principle to serve as a focus for the development of teaching support resources and the cross-school activities that they will be conducting with students. At the beginning of the INSTEP project, a list of general science principles that were targeted by the AAAS sponsored *Project 2061*, was distributed to district-level administrators. These administrators were asked to rank the general science principles according to compatibility with their districts curriculum quidelines. Items with the lowest mean ranks by the administrators were removed from the list that was distributed to the participants. As a result of group discussion during the first joint meeting of INSTEP participants, the theme *Ecosystems are based on abiotic and biotic factor* was selected.

Workshops and on-site visitations were used to familiarize the INSTEP participants with the use of electronic mail and the procedures for contributing a lesson plans on UNITE. Any user can contribute to a UNITE resource by first selecting the *Add a New Resource* or the *Modify an Existing Resource* option. A step-by-step procedure is followed as the user is guided through the contribution process.

During one of the early INSTEP workshops, the method for evaluating lesson plan entries was discussed in depth and the teachers ultimately elected a peer review process with all INSTEP participants as sanctioned reviewers. This review process begins after a teacher contributes a lesson plan on their local station and an electronic message is sent to all reviewers which briefly explains the content of the lesson and the target grade level(s). When a reviewer volunteers to evaluate the lesson, the complete lesson is sent to the reviewer 's station. The reviewer and contributor then communicate via electronic mail regarding the lesson plan's design. Once any discrepancies are resolved, the new lesson plan is distributed across the system where additional suggestions can be added for adapting the lesson plan to other settings.

The peer-review process for evaluating community-published resources allows a resource to become generally accessible to all users after it has been evaluated by only one reviewer. Although guidelines for reviewing were developed, the INSTEP participants recognized that the one-reviewer process would be less rigid than using an established panel of reviewers for validating resources. Their argument was that the benefits of diversity and collegiality, resulting from a more open review process, far outweigh any increase in quality which may result from a more top-down review process. This theme of adopting a bottom-up approach to the professional development of teachers was prevalent throughout the INSTEP activities.

Cross-school Inquiry Activities

Using the general science principle *Ecosystems are based on abiotic and biotic factors* as the guiding theme, the INSTEP participants selected two activities for conducting cross-school inquires: *leaf stomata research* and a *school consumption audit*. The leaf stomata research was designed to establish a baseline of cottonwood leaf stomata means in the Kansas City area. Stomatal counts were thought to be a valuable bioindicator of predicted environmental changes. The School Consumption Audit was designed to explore the schools' energy efficiency and social climate by investigating interrelate variables, such as building age, school populations, building dimensions, electricity and water consumption. Both inquiries were exploratory, in that they were designed to increase participant awareness in terms of needs and possible actions that could be taken.

Initial Observations

Involving teachers in innovative projects is challenging. They often feel pressed for time and have developed routines which are perpetuated by both habit and the institutional structure of schools (Kerr, 1985; Heinich, 1984). Questionnaires administered to the participants revealed that some of the teachers became involved with the INSTEP project because they were influenced by external forces such as the principal or district administrator's request. While other teachers agreed to participate because of an interest in classroom and personal use of computer technology as well as for the sharing of ideas and resources. Researchers (Martin &

Clemente, 1990; Aust, Allen & Bichelmeyer, 1989) have found that teachers indicate a strong desire to become involved in using and developing innovative strategies for applying technology in education. And, in an extensive review of the involvement of teachers with instructional technologies, Cuban (1986) asserts that technology can serve as an powerful tool for building collaboration among teachers.

New technology may provide a hook for encouraging teachers to become involved in innovative projects but the overriding factor appears to be the collegiality and recognition by other teachers. Outside of recognition by students in the classroom, there are too few mechanisms for acknowledging a teacher's accomplishments. Selection of review process for evaluating lesson plans suggests that INSTEP participants may respect peer recognition over other forms of acknowledgement. One of the most rewarding satisfaction for teachers may come from knowing that the teaching ideas they have refined through years of practice are now being widely used by other teachers.

References

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Martin B. L. & Clemente R. (1990). Instructional systems design and public schools. Educational Technology Research and Development Journal, 38,(2), 81-85.

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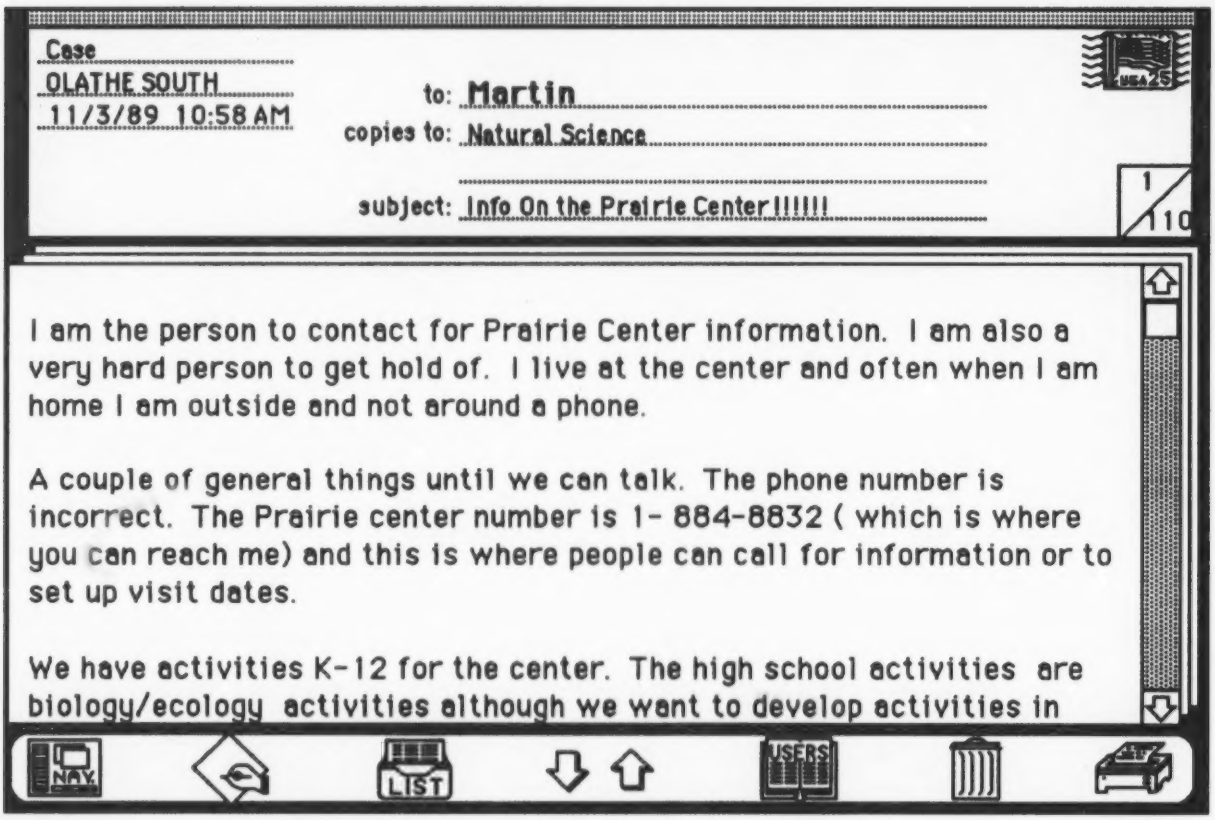
Nelson, T. H. (1982) A new home for the mind. Datamation (March, 1982): 169-180.

Sirotnik, K.A. & Clark, R.W. (1988). School-centered decision making. Kappan, 69(9), 660-664.

Figure 1

The Electronic Mail System

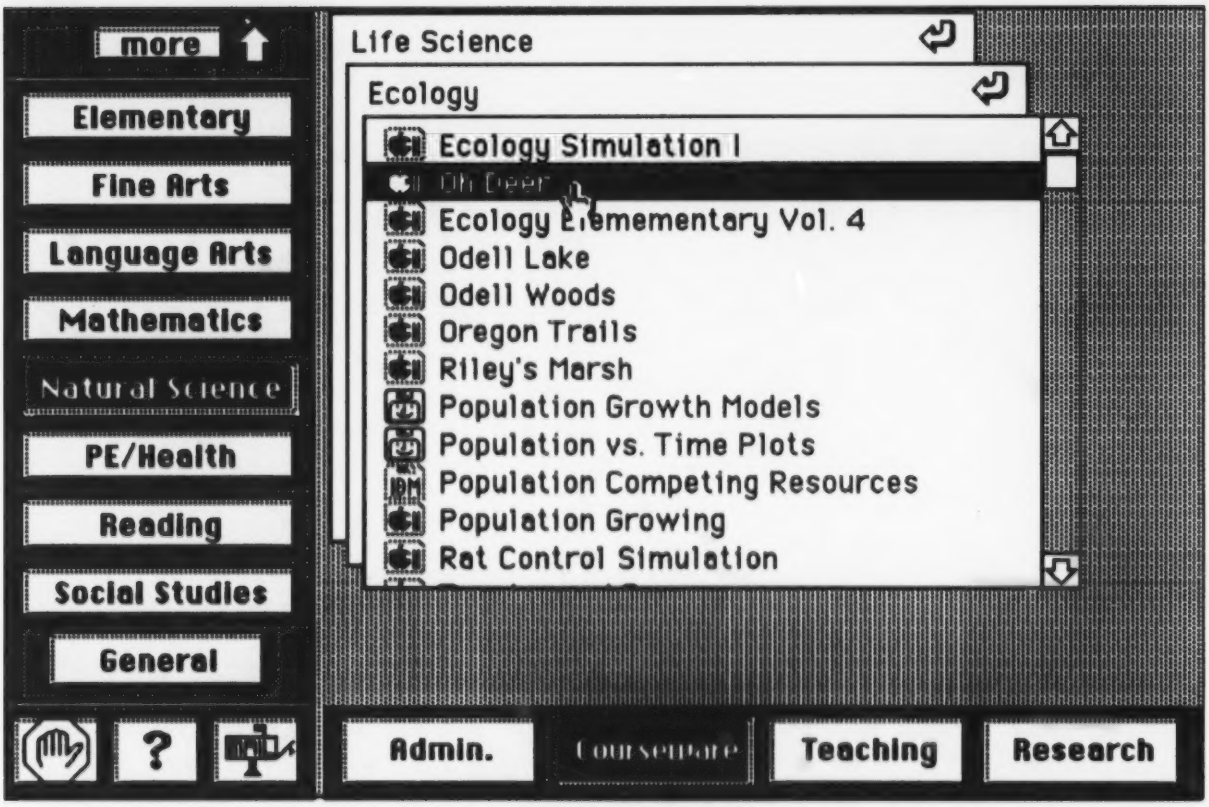

Case
OLATHE SOUTH
11/3/89 10:58 AM
to: Martin
copies to: Natural Science
subject: Info On the Prairie Center!!!!!!
1
110
I am the person to contact for Prairie Center information. I am also a very hard person to get hold of. I live at the center and often when I am home I am outside and not around a phone.
A couple of general things until we can talk. The phone number is incorrect. The Prairie center number is 1- 884-8832 (which is where you can reach me) and this is where people can call for information or to set up visit dates.
We have activities K-12 for the center. The high school activities are biology/ecology activities although we want to develop activities in
NAV
LIST
USERS

This message was sent over the network on November 3, 1989. The upper right corner shows a cancelled stamp indicating that the message has been mailed. Directly below the stamp are numbers showing that this is message 1 of 110. From left to right along the bottom of the screen are buttons for:

1 returning to the Resource Navigator;
2 writing a message;
3 viewing the mail list;
4 proceeding to the next message;
5 going to the previous message;
6 viewing information about the users including: the content and grade level they teach, where they teach and the special interest groups they belong to;
7 throwing away messages; and
8 printing the message.

Figure 2

UNITE Resource Navigation System

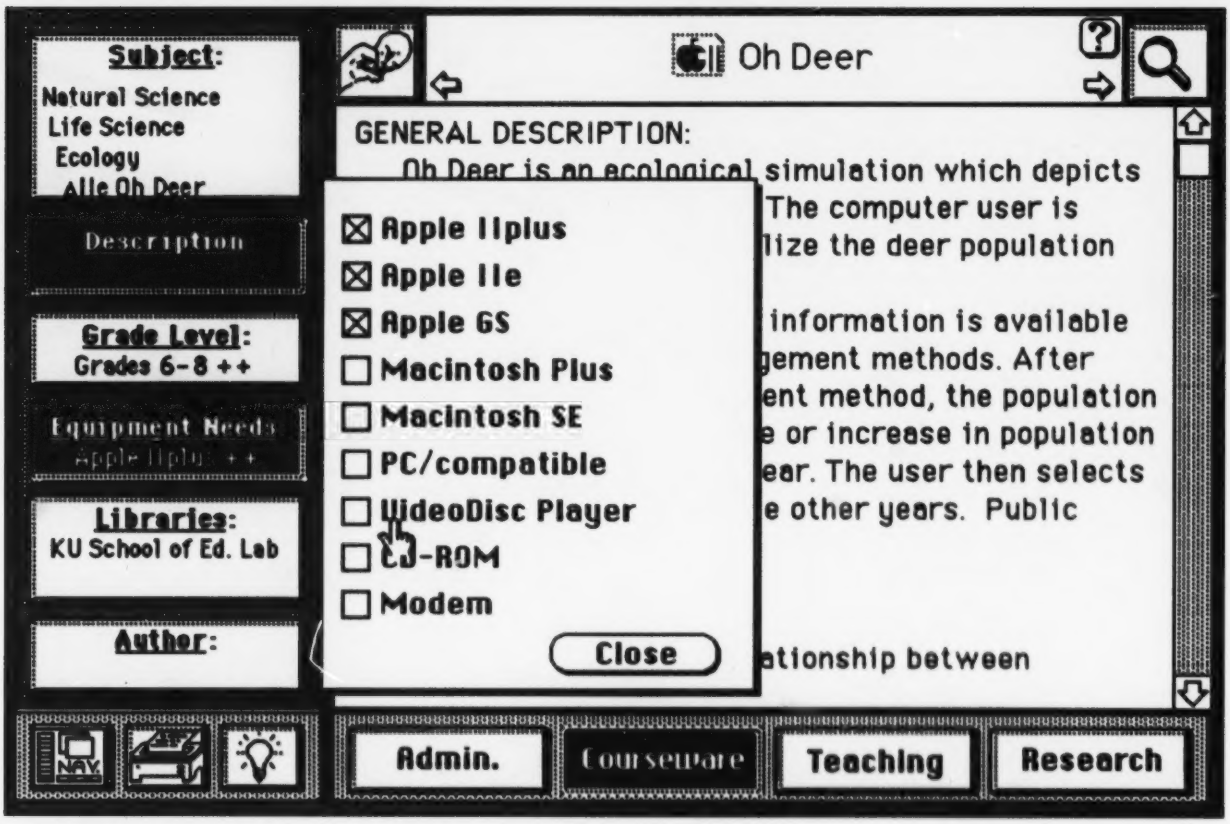


Content categories are located vertically along the left margin of the screen and the four support categories, Administration, Courseware, Teaching and Research are located horizontally along the the bottom of the UNITE resource navigator. In this view the user began by selecting the support category for Courseware followed by the main content category Natural Science and then the sub-categories of Life Science and Ecology.

The user has just selected the software Oh Deer which is an ecological simulation of an overpopulated deer heard. The icon that precedes the courseware name indicates that the Oh Deer program is for an Apple IIe computer, that it is available in at least one of the participating schools and that there is an entry for Oh Deer in the UNITE catalog of courseware. Having clicked on the Oh Deer courseware, the user will be taken directly to the catalog entry depicted in Figure 3.

Figure 3

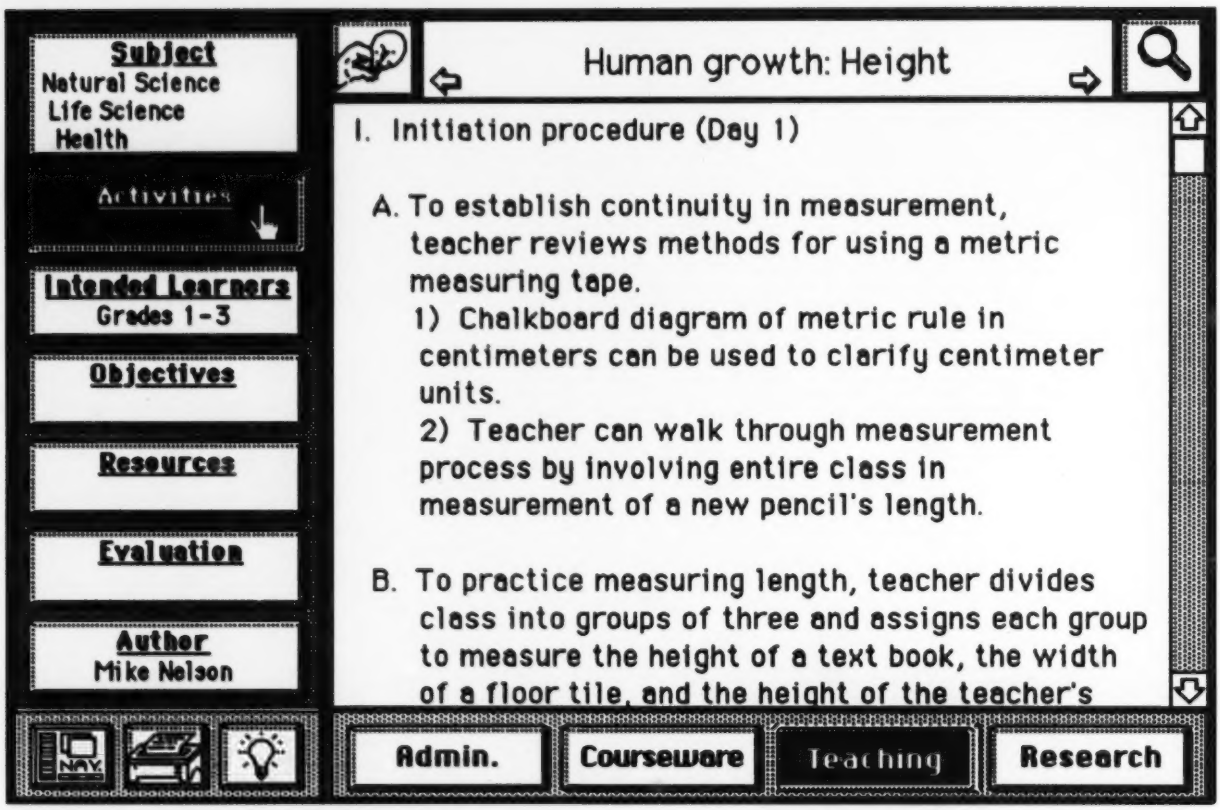
Overlapping Windows showing the Equipment needed to use Courseware



Through the use of buttons and overlapping windows, users can pick the type of information that is most appropriate for their immediate needs. For example, the viewer can tell from the icon adjacent to the name that the software will work with an Apple IIplus computer but will it work with the newer Apple GS or does it make use of a VideoDisc player? By clicking on the equipment button the user sees that the Oh Deer software will run on Apple IIplus, Apple IIe and Apple GS computers and that a VideoDisc or CD-ROM player is not required.

Figure 4

An Entry in the Lesson Plan Catalog


Subject
Natural Science
Life Science
Health
Activities
Intended Learners
Grades 1-3
Objectives
Resources
Evaluation
Author
Mike Nelson
Human growth: Height
I. Initiation procedure (Day 1)
A. To establish continuity in measurement, teacher reviews methods for using a metric measuring tape.
1) Chalkboard diagram of metric rule in centimeters can be used to clarify centimeter units.
2) Teacher can walk through measurement process by involving entire class in measurement of a new pencil's length.
B. To practice measuring length, teacher divides class into groups of three and assigns each group to measure the height of a text book, the width of a floor tile, and the height of the teacher's
Admin.
Courseware
Teaching
Research

Additional information is available by clicking on one of the lesson plan categories along the left margin: *Subject, Activities, Intended Learners, Objectives, Resources, Evaluation* and *Author*. In this view the user began by selecting the support category for *Teaching*. The main content category *Natural Science* and then the subcategories of *Life Science* and *Health* were selected. The user has selected *Activities* for the lesson plan *Human Growth: Height*. The "hand holding the light bulb" icon indicates that the lesson plan catalog is a community published resource.